Evaluation of the Internal Environmental Conditions of the Jerash Archaeological Museum in Jordan

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Abstract:

Jerash Archeological Museum is located on a high hill overlooking the ancient and residential city of Jerash, Jordan. It contains a lot of organic collocations such as bones, ivory and inorganic material, including pottery, stone, glass, and metal from various periods and civilizations of Jerash since the stone age. These artifacts are exhibited in showcases or without showcases in the museum. The present research paper aims to evaluate the degrees of relative humidity, temperature, and light inside the museum and their impact on the collections. Fluctuations of temperature and humidity caused by external factors, including climate, or visitors are a serious problem for many museums. Most of the recent studies related to the conservation and protection of antiquities recommend the application of the concept of preventive conservation that includes controlling temperature and relative humidity in museums to balance relative humidity, for instance, in the surrounding environment to protect these materials. The study was carried out inside Jerash Archaeological Museum by measuring the temperature and relative humidity using Datalogger and Digital Light Meter to measure the intensity of lighting for a year from November 2019 to October 2020. The portable digital microscope was used to study the surfaces of some museum artifacts. The results indicated that the environmental conditions inside the museum are not controlled and there is a large fluctuation of the degrees of relative humidity and temperature throughout the year. The highest value of relative humidity (95.4%) was reported in January, whereas the highest value of temperature (38.4°C) was in June. Thus, some artifacts, especially the metals, were deteriorated and it may cause the damage of some archaeological collections, especially metals. Urgent intervention and appropriate measures must be taken to reduce the risk of these conditions to preserve these artifacts from deterioration.

Key Words:

Internal environment, preventive conservation, relative humidity, Jerash Archaeological Museum, Jordan.

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Introduction

Archaeological awareness and interest in cultural heritage have increased worldwide. Therefore, many countries have developed regulations and laws to maintain and protect heritage, establish scientific and administrative centers, and qualify the staff and specialists for the optimal maintenance of heritage, especially on-site and in museums where there are several dangers. Because of the exposure of the archaeological heritage to several dangers, actions should be taken for protection through the consolidation of the knowledge of protection, evaluating the real causes of the deterioration of archaeological collections, and exploring the appropriate conservation methods in stores and exhibition rooms in museums. Moreover, actions should be taken and strategic plans should be made against natural and human risks, e.g., weather, fire, flood, theft, and vandalism, that endanger museum collections. Preventive conservation is necessary for protecting archaeological heritage, considering the evolving social circumstances and age developments, such as crises, wars, and disasters. Thus, early intervention to save the archaeological heritage is a must (Said Abdel-Karim Alhajji, 2017, p.35). Practical procedures should be applied to protect archaeological heritage in museums and archaeological stores in Jordan by conducting studies on the surrounding environmental conditions.

Jordan has more than 40 museums, including museums of monuments, history, folklore, natural history, arts, military, coins, plants, documentaries, as well as museums for children. Some of these museums are owned by the state and the army, in the public domain, and others are owned by universities, banks, and individuals, in the private domain. These museums are an important source for identifying the cultural history of Jordan and help promote mutual understanding, cooperation, and peace among people because they contain a mixture of history, heritage, art, and science. Because of their importance, the state paid special attention to the building of these museums, making them evidence of the human civilizations and historical events (Mohammed Hamad Albishtawi, 2018, p. 164). One of these museums is Jerash Archaeological Museum.

Jerash Archaeological Museum

It was established in 1963 in the basement of Artemis Temple. In 1985, it was moved to its current building entitled “Jordan through History” with the help of Yarmouk University and the Ministry of Tourism and Antiquities. The building was used as a rest house, so it does not represent any local architectural style. It overlooks Jerash Archaeological City and the modern city. Thus, it is a highly important monument. Besides the Museums of Karak and Petra, Jerash Archaeological Museum is one of the museums on the site because this type of museum relates to a certain location. Jerash Archaeological Museum was founded in the area of obtaining the excavated artifacts (Mazen Rasmy Rateb, 1993, p. 85).

It is administratively affiliated with the Department of Antiquities in Jordan. In the front area of the museum, some marble and stone statues and memorials with writings in Greek and Latin, stone coffins decorated with floral and geometric figures, and stone altars are exhibited. In the back area, many memorials are exhibited. The museum consists of one floor and several internal sections, as follows:

- *Entrance Hall*: It has an irregular shape. It is used for several purposes, such as information desk and exhibition area of some paintings, artifacts, and large sculptures. It is also used to

access the rooms and halls of the museum.

- *Showroom*: It looks triangle with some modifications and expansions.
- *Administrative Offices*: The office of the curator and small rooms for the observers.
- *Facilities and services*: There is a store far from the building in Artemis. It was formerly the official museum.
- The museum has a kitchen and toilets. In a near area, there is the sound and light show room. Around the temple, there is a park and a wide area, giving it natural beauty. Trees act as air fresheners and windbreaks. Moreover, the park is used for outdoor exhibitions. However, the museum lacks many necessary facilities (Mazen Rasmy Rateb, 1993, p. 86). Figure (1) shows A general plan for the Jerash Archaeological Museum.

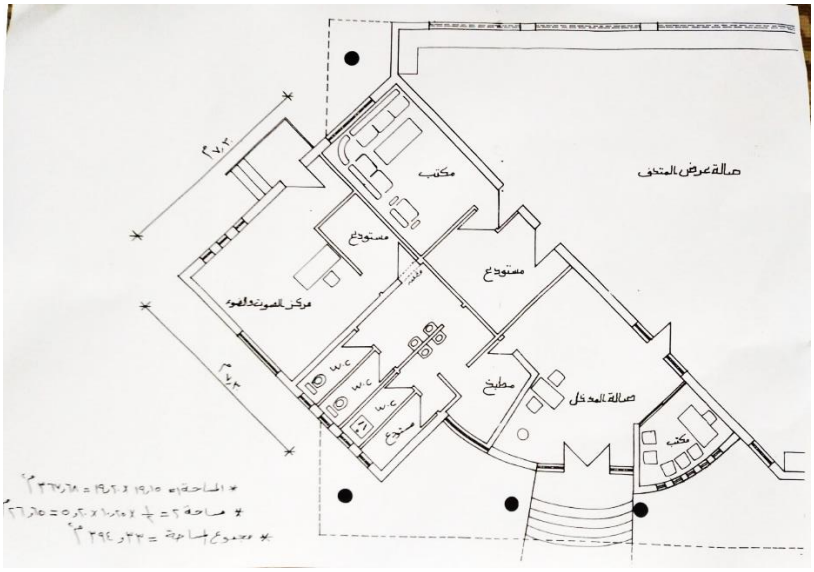

Figure (1) shows A general plan for the Jerash Archaeological Museum

Discussion of Results:

- Studying the internal environmental conditions of Jerash Archaeological Museum shows that most of them are poor and affect negatively the exhibited and stored collections. The relative humidity of most museum collections ranges from (45%) to (55%). It should not increase or decrease by (5%). Furthermore, the temperature should not be higher than 18 ^{o}C (NPS Museum Handbook, 2016, pp. 24-26). Measurements of relative humidity showed that it exceeded the allowed limit, registering the highest rate of (95.4%) in January and the lowest rate of (48.8%) in June. This fluctuation over the year causes the deterioration and degradation of artifacts in the exhibition and storage areas. While the highest degree of temperature (38.4 ^{O}C) was recorded in June, the lowest degree (17.6 ^{O}C) was in January. There is a clear fluctuation of temperature and humidity throughout the year. There is an inverse relationship between temperature and relative humidity. The results illustrated that most museum techniques are exposed to high temperature and humidity throughout the year. This is a serious indicator of the preservation of these collections.

- Studying the intensity of lighting showed high rates. In other words, using bright and natural lighting in museum exhibitions for a long time caused damage to the artifacts, especially the colored ones. Similarly, inappropriate temperature could cause quick damage to the artifacts.
- Examination using the mobile digital optical microscope showed salt crystallization on the surface of some examined pottery artifacts, causing pressure, as well as cracks and deterioration on the body (Buys & Oakly, 1999, p.23). Salt recrystallization takes place due to high rates of humidity in the surrounding environment. Moreover, some metal artifacts have deteriorated. For instance, corrosion products appeared on the cleaver because iron reacts with oxygen under high humidity, forming a layer of incoherent alkaline iron oxides, iron hydroxides, ferrous, and iron chlorides in the presence of chlorine ion (Garcia et al., 1998, p.120).
- The bronze alloy has deteriorated, forming a phenomenon known as bronze disease. In an examined artifact, there were light green spots due to high rates of humidity while having chlorine ions (Scott, 1990, p.193). Controlling relative humidity is the best solution to prevent bronze disease (Bradley,2005, p. 160).
- Studying glassware showed holes that indicate corrosion. Some small isolated holes appeared, then increased, and connected over time, forming larger and bigger ones (Ournié et al., 2008, pp.2142-2154). High humidity is the main cause of glass corrosion, forming an inadequate environment (Newton,1985, p. 21). The lack of humidity in the surrounding environment preserves glass for long periods (Cronyn, 1990, p. 130).

Conclusion and Recommendations:

– The results showed uncontrolled environmental conditions. Thus, they should receive due attention, and plans and strategies should be developed to control the climate inside the museum because these measures help control temperature and humidity and protect the artifacts against deterioration and degradation. This could be achieved by setting climate at fixed degrees in the showrooms, showcases, and store areas to provide stable circumstances of display and storage. A central air conditioner is used to control temperature and humidity throughout the day. Measurement and control devices are used to monitor these degrees in every showcase, and a central air purification system purifies air from air pollutants.

– The ideal preservation and exhibition method is achieved by providing temperatures and humidity separately inside the cases according to the type of the artifact because every material, either organic or inorganic, should have certain preservation degrees.

– Lightning is controlled, and daylight is not used. Only indirect lighting, such as reflected lightning, is utilized. Moreover, filters of harmful radiation can be employed. These measures help protect the Jordanian heritage for future generations because it maintains the identity, survival, and continuity of the nation.

– Regular maintenance of the displayed artifacts should be carried out, and appropriate environmental conditions should be provided.

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